Ran Holtzman

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Research interests

I study the physics of multiphase flow in particulate, porous media. I seek fundamental understanding of phenomena in which fluid flow plays an essential role, such as mechanical deformation of the solid matrix, solid/fluid and fluid-fluid reactions. I use theoretical/numerical modeling combined with experiments to identify the dominant mechanisms and governing parameters at the pore-scale, a knowledge which is then applied to understand relevant phenomena at larger scales. Current research areas include methane hydrates and methane venting, mechanics of soft sediments, flow instabilities and soil wetting and drying.

Education

1995-1998	B.Sc. in Geological and Environmental Science (Cum laude). Major: Engineering Geology. Ben-Gurion University, Israel.
1998-2000	B.Sc. in Civil Engineering (Cum laude). Major: Geotechnical Engineering. Technion, Israel Institute of Technology.
2000-2003	M.S. in Agricultural Engineering (Water, Soil and Environmental Sciences). Technion. Adviser: Professor Uri Shavit.
2003-2008	Ph.D. in Civil and Environmental Engineering, University of California, Berkeley. Adviser: Professor Tadeusz W. Patzek.

Professional experience

1997-1998	Research assistant, Rock slope stability analysis. PI: Yossef Hatzor, Ben-Gurion University.
1999-2000	Graduate research assistant, Modeling formation of salinity plumes in groundwater. PI: Uri Shavit, Technion.
2002-2003	Environmental Engineer at “Agat Engineering Ltd.”.
2004-2006	Graduate research assistant, Modeling injection of water to the subsurface. PI: Dmitriy Silin and Tad Patzek, UC Berkeley.
2006-2008	Graduate research assistant, Geomechanical performance of hydrate-bearing sediments in offshore environments. PI: Tad Patzek and Dmitriy Silin, UC Berkeley.
2009-present	Postdoctoral Associate in the Department of Civil and Environmental Engineering. PI: Ruben Juanes, Massachusetts Institute of Technology.

Teaching experience

1999-2002	Graduate student instructor: *Fluid Mechanics*; *Engineering Geology*; *Technical Report*;

Earth-moving Equipment and Systems (Technion).

2005-2006 Graduate student instructor: *Groundwater & Seepage* (UC Berkeley).

2007-2007 Lecturer for the National Student Leadership Conference, Berkeley, CA.

Fellowships and awards

10/1995-09/1996	Department Head's Excellence Award, Ben-Gurion University, Israel.
10/1996-09/1997	Natural Sciences Dean's Excellence Award, Ben-Gurion University, Israel.
10/1997-09/1998	Department Head's Excellence Award, Ben-Gurion University, Israel.
10/1998-02/1999	President's Excellence Award, Technion, Israel.
03/1999-07/1999	The Civil Engineering Dean's Excellence Award, Technion, Israel.
10/1999-02/2000	President's Excellence Award, Technion, Israel.
03/2000-07/2000	The Civil Engineering Dean's Excellence Award, Technion, Israel.
10/2000-07/2001	Best Teaching Assistant Award, Technion, Israel.
10/2001-02/2002	Grand Water Research Institute Excellence Scholarship Award, Technion.
08/2003-05/2005	Jane Lewis Fellowship, University of California, Berkeley.
12/2006	Outstanding Student Paper Award, AGU Fall 2006 meeting.
07/2007	USACM Graduate Student Fellowship award.
12/2007	Outstanding Student Paper Award, AGU Fall 2007 meeting.

Reviewer for Journals

Chemical Engineering Science.

Publications

Journal articles

[1] Holtzman, R. and Juanes, R., Crossover from fingering to fracturing in deformable disordered media. *Physical Review E*, 82(4):046305 (2010), doi:10.1103/PhysRevE.82.046305.

[2] Holtzman, R., Silin, D.B., Patzek, T.W., Frictional granular mechanics: A variational approach. *International Journal for Numerical Methods in Engineering*, 81(10): 1259-1280 (2010), doi:10.1002/nme.2727.

[3] Holtzman, R., Silin, D.B., Patzek, T.W., Mechanical properties of granular materials: A variational approach to grain-scale simulations. *International Journal for Numerical and Analytical Methods in Geomechanics*, 33 (3): 391-404 (2009), doi:10.1002/nag.725.

[4] Holtzman, R., Shavit, U. , Segal-Rozenhaimer, M., Gavrieli, I., Marei, A., Farber, E., Vengosh, A., Quantifying ground water inputs along the lower Jordan River. *Journal of Environmental Quality*, 34: 897-906 (2005), doi:10.2134/jeq2004.0244.

[5] Farber, E., Vengosh, A. , Gavrieli, I., Marie, A., Bullen, T.D., Mayer, B., Holtzman, R. , Segal, M., and Shavit, U., Management scenarios for the Jordan River salinity crisis. *Applied Geochemistry*, 20 (11): 2138-2153 (2005), doi:10.1016/j.apgeochem.2005.07.007.

[6] Segal, M. , Shavit, U., Vengosh, A., Gavrieli, I., Farber, E. , Holtzman, R., Mayer, B., Shaviv, A., Sources and transformations of nitrogen compounds along the lower Jordan River. *Journal of Environmental Quality*, 33: 1440-1451 (2004), doi:10.2134/jeq2004.1440.

[7] Farber, E., Vengosh, A., Gavrieli, I., Marie, A., Bullen, T., Mayer, B., Holtzman, R. , Segal, M., Shavit, U., The origin and mechanisms of salinization of the Lower Jordan River. *Geochimica et Cosmochimica Acta*, 68: 1989-2006 (2004), doi:10.1016/j.gca.2003.09.021.

Conference papers

[1] Silin, D.B., Holtzman, R., Patzek, T.W. and Brink, J. L., Monitoring waterflood operations: hall's method revisited. SPE Paper Number 93879, SPE Western Regional Meeting, Irvine, CA, 30 March – 1 April 2005.

[2] Silin, D.B., Holtzman, R., Patzek, T.W. and Brink, J. L., Waterflood surveillance and control: incorporating hall plot and slope analysis. SPE Paper Number 95685, SPE Annual Technical Conference and Exhibition, Dallas, TX, 9 – 12 October 2005.

[3] Holtzman, R., Silin, D.B., Patzek, T.W., Micromechanics of hydrate dissociation in marine sediments by grain-scale simulations. SPE Paper Number 114223, 2008 SPE Western Regional and Pacific Section AAPG Joint Meeting, Bakersfield, CA, 31 March-2 April 2008.

Other conference contributions

Lectures

[4] Holtzman, R., Juanes, R., Crossover from fingering to fracturing in deformable disordered media. 2010 Fall Meeting, AGU, San-Francisco, CA, 2010.

[5] Holtzman, R., Juanes, R., Hydrate Formation in Gas-Rich Marine Sediments: A Grain-Scale Model. 2009 Fall Meeting, AGU, San-Francisco, CA, 2009.

[6] Holtzman, R., Silin, D.B., Patzek, T.W., Nonlinear Deformation of Weakly-Cemented Sediments: A Paradigm? 10th U.S. National Congress for Computational Mechanics, Columbus, OH, USA, 2009.

[7] Holtzman, R., Jain, A.K., Juanes, R., A Grain-Scale Model Coupling Mechanics, Multiphase Fluid Flow, and the Kinetics of Hydrate Formation. 10th U.S. National Congress for Computational Mechanics, Columbus, OH, USA, 2009.

[8] Holtzman, R., Consequences of hydrate dissociation in marine sediments by grain-scale simulations. 2008 SPE Western Regional Student Paper Contest, Bakersfield, CA, 2008.

[9] Holtzman, R., Silin, D.B., Patzek, T.W., Frictional Granular Mechanics: A Variational Approach to Grain-Scale Simulations. CMG 2008 - 27th IUGG Conference on Mathematical Geophysics, Longyearbyen, Norway, 2008.

[10] Holtzman, R., Silin, D.B., Patzek, T.W., Mechanical Properties of Granular Materials: A Variational Approach to Grain-Scale Simulations. 8th World Congress on Computational Mechanics, Venice, Italy, 2008.

[11] Holtzman, R., Silin, D.B., Patzek, T.W., Deformations of sediments via grain-scale simulations: a quasi static approach. 2007 Fall Meeting, AGU, San-Francisco, CA, 2007.

[12] Holtzman, R., Silin, D.B., Patzek, T.W., Micromechanics of hydrate-bearing sediments by grain-scale simulations. 2007 Fall Meeting, AGU, San-Francisco, CA, 2007.

[13] Holtzman, R., Silin, D.B., Patzek, T.W., Mechanical properties of granular media via grain-scale simulations. 9th US National Congress in Computational Mechanics, San-Francisco, CA, 2007.

[14] Holtzman, R., Effective elastic properties via grain-scale simulations. 2007 SPE Western Regional Student Paper Contest, Long Beach, CA, 2007.

Posters

[15] Holtzman, R., Juanes, R., Crossover from fingering to fracturing in deformable disordered media. Gordon Research Conference on Flow & Transport In Permeable Media, Lewiston, ME, 2010.

[16] Holtzman, R., Juanes, R., Hydrate growth in gas-rich sediments: A grain-scale model. Gordon Research Conference on Natural Gas Hydrate Systems, Waterville, ME, 2010.

[17] Holtzman, R., Silin, D.B., Patzek, T.W., Estimating macroscopic mechanical properties via grain-scale simulations. 2007 AAPG Annual Convention, Long Beach, CA, 2007.

[18] Holtzman, R., Silin, D.B., Patzek, T.W., The strength of hydrate-bearing sediments: a grain-scale approach, EOS Transactions, AGU, 87(52), Fall Meeting Supplement, Abstract MR51A-0960. 2006 Fall Meeting, AGU, San-Francisco, CA, 2006.

[19] Holtzman, R., Shavit, U., Segal, M., Vengosh, A., Farber, E., Gavrieli, I., Salinization sources along the lower Jordan River under drought conditions, EOS Transactions, AGU, 84(46), Fall Meeting Supplement, Abstract H12B-0987. 2003 Fall Meeting, AGU, San-Francisco, CA, 2003.

Other publications

[20] Shavit, U., Holtzman, R., Segal, M., Vengosh, A., Farber, E., Gavrieli, I., Bullen, T., ECO-Research Team. Water sources and quality along the lower Jordan River, regional study, in *Water resources quality, preserving the quality of our water resources*, Edited by Rubin, H., Nachtnebel, H.P., Furst, J., and Shamir, U., Springer-Verlag, Berlin, pp. 127-148 (2002).

[21] Holtzman, R., Micromechanics of sediments: A variational approach to grain-scale simulations. Ph.D. thesis, University of California, Berkeley, CA (2008).

Invited seminars

06/2007	Department of Environmental Sciences and Energy Research, Weizmann Institute of Science, Israel.
06/2007	Department of Geological & Environmental Sciences, Ben-Gurion University, Israel.
06/2007	Geophysics Department, Lawrence Berkeley National Laboratory, Berkeley, CA.
04/2008	Department of Geophysics, Stanford University, Stanford, CA.
06/2008	Physics of Geological Processes, Oslo University, Oslo, Norway.

08/2008	Department of Civil and Environmental Engineering, Massachusetts Institute of Technology, Cambridge, MA.
12/2009	Department of Environmental Sciences and Energy Research, Weizmann Institute of Science, Israel.